



O N E O S   V 4 . 3 R 4

O N E O S   V 5 . 1 R 3

V O I C E   O V E R   A T M

&   C I R C U I T   E M U L A T I O N   S E R V I C E

U S E R   G U I D E

( E D I T I O N   1 0 )

OneAccess Networks  
Pentagone Plaza  
381, Avenue du Général de Gaulle  
92140 Clamart  
FRANCE

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## 1 INTRODUCTION

This edition of the OneOS Voice Manual corresponds to the V4.3R4 and V5.1R3 software releases of OneOS. It is also available for all previous software releases of OneOS according to the feature matrix described hereafter.

The OneOS software developed for use with the ONE product range offers an extensive range of features designed to provide a complete & highly powerful range of multi-service access routers:

- Full IP router with NAPT, Security, and Quality of Service management
- Support of voice for analog and ISDN S0/T0 terminals using Voice over IP and Voice over ATM
- Interworking of data protocols (FR, X.25, PAD, XOT, X.31)
- Advanced management tools based on CLI (Command Line Interface), SNMP, FTP/TFTP

This document is the OneOS user guide for voice over ATM-related functions of the OneOS-based range products that are voice enabled.

Seven other user guides and two global indexes are available:

- o OneOS – Admin User Guide
- o OneOS – Bridging & LAN User Guide
- o OneOS – Basic IP User Guide
- o OneOS – Advanced IP User Guide
- o OneOS – WAN User Guide
- o OneOS – VoIP User Guide
- o OneOS – IBC User Guide
- o Index of OneOS User Guides (global table of contents)
- o Index of CLI of OneOS User Guides (global list of CLI commands)

## 1.1 FEATURE MATRIX

The following table is a resource providing edition by edition the released features. The table was done as of the release V3.5R2E3. For simplification, the indicated software release shows the presence of a feature in a given software release. It should be noted that most features were available in earlier versions.

| Main Function                            | Feature                                              | Present at least in: |
|------------------------------------------|------------------------------------------------------|----------------------|
| <b>Circuit Emulation Service (AAL-1)</b> | CES over E1 (ONE200): structured/ unstructured mode  | V3.5R2E3             |
|                                          | Loops on the serial/E1 and ATM sides                 | V3.5R2E3             |
|                                          | CES over serial (V.11/X.21, V.35) (ONE200)           | V3.5R2E3             |
| <b>Voice over ATM (AAL-2)</b>            | BLES (AF-VMOA-00145): voice over AAL-2               | V3.5R2E3             |
|                                          | VTOA-113 (trunking over AAL-2)                       | V3.5R2E3             |
|                                          | Debug V5 signaling                                   | V3.5R2E3             |
|                                          | G.711 and G.726 voice coding                         | V3.5R2E3             |
|                                          | AAL-2 cell multiplexing (bandwidth optimization)     | V3.5R2E3             |
|                                          | Echo cancellation disabling when detecting fax/modem | V3.5R2E3             |
|                                          | Configurable ringing tones for various countries     | V3.5R2E3             |
|                                          | Clock synchronization: AAL-2, DSL, free-run, slave   | V3.5R2E3             |
|                                          | configurable jitter                                  | V3.5R2E3             |
|                                          | Silence detection / comfort noise                    | V3.5R2E3             |

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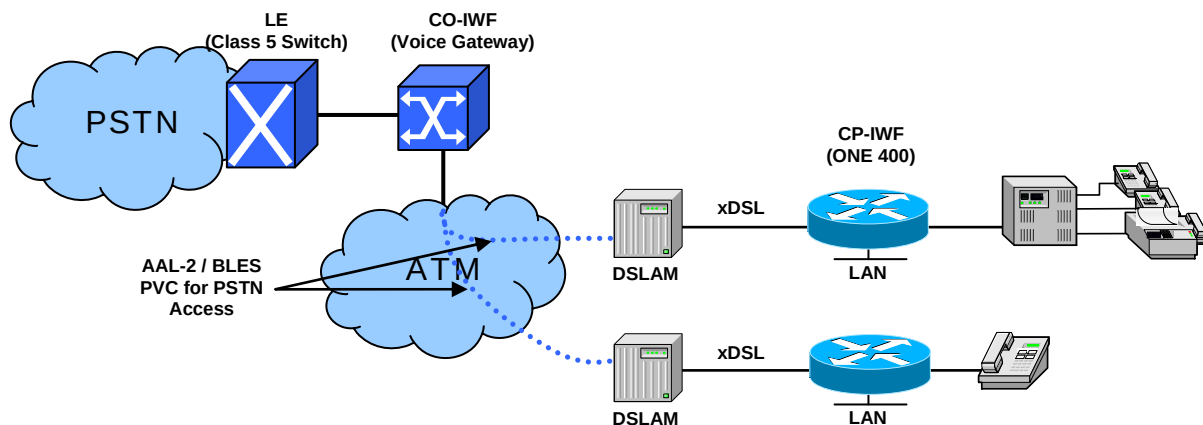
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## 2 VOICE OVER ATM & CIRCUIT EMULATION

### 2.1 INTRODUCTION TO VOATM & CES

The OneOS-based voice-capable router enables the connection of conventional telephone terminals (ISDN or analog), or PBX (ISDN BRI/PRI or analog), to the PSTN through an ATM/DSL network in compliance with the Broadband Loop Emulation Service (BLES), with standard for Voice Trunking over ATM specified by the ATM Forum (AF-VMOA-145, AF-LES-02.03, AF-VTOA-113), or with the Circuit Emulation Service (CES) specified by the ATM Forum (AF-VTOA-78). The Circuit Emulation Service can also be offered on a serial V.11/X.24/V.28/V.36 interface for a full-transparent data connection.



Architecture for access to the PSTN using BLES (Broadband Loop Emulation Service)

#### 2.1.1 BLES/VTOA Protocol Overview

##### 2.1.1.1 Signaling Processing

The BLES protocol enables connection of conventional telephone subscribers to the switched telephone network by delivering an equivalent level of service: the access device (e.g. the OneOS-based voice-capable router) transparently transmits call signaling to the voice gateway in the Central Office (CO) without performing any analysis. The access device is referred to in the BLES standard as the Customer Premises Inter-Working Function (CP-IWF), whereas the voice gateway is referred to as the Central Office Inter-Working Function (CO-IWF). Additional telephone services (e.g. forwarding, transfers, double call) are managed directly by the Class 5 switch (LE) connected to the voice gateway.

For S0 and S2 interfaces, ISDN signaling (messages on channel D) is transparently relayed to the V5.2 interface of the voice gateway.

For POTS (analog) interface, only CAS mode is supported. The on-hook/off-hook states and ringing are transmitted in-band (in the CID allocated for the voice port).

The VTOA protocol enables connection of an E1 PBX to a voice gateway supporting this mode. It also enables connection between two E1 PBX through an ATM network. As with BLES, signaling messages

(D channel) are transported transparently end-to-end. The ONE400 supports CCS mode (transport of signaling messages over a D channel); CAS (Channel Associated Signaling) mode is not supported.

The Circuit Emulation Service (CES) enables connection of an E1 PBX to a voice gateway or ATM switch supporting the CES interworking function. As VTOA, it enables also connection between two E1 devices through the ATM network. The signaling time slots (CCS or CAS) are transported transparently end-to-end.

#### 2.1.1.2 Voice Processing (BLES / VTOA-113)

With telephone subscribers using ISDN, the voice signal coded in PCM 64Kbps (G.711 A-law or  $\mu$ -law) from the subscriber side is either transmitted transparently or coded with a lower bit rate (e.g. in ADPCM - G.726- 32Kbps) by the access device. The transit delay from the subscriber to the Class 5 switch can be higher than a few tens of milliseconds; consequently, the access device must cancel the electric echo generated by the 2 wire/4 wire device inside the connected analog telephone terminals (the voice gateway also cancels the echo at the switched network side). In order to reduce the bandwidth requirement for voice communication, silence can be suppressed. During silence, the device (voice gateway or access device) periodically sends Silence IDentification patterns (SID) until voice frames are received again. The device receiving a SID generates comfort noise in accordance to the noise level provided by the SID.

The BLES and VTOA standards specify possible options for voice coding called profiles. A profile specifies the type of coders (G.711 or ADPCM G.726), the silence detection, and the frequency of voice frame transmission. The same profile used by a voice interface must be selected in the access equipment and the voice gateway. A profile specifies several coders with or without silence detection. The coder selection in a profile is carried out either in (configurable in the OneOS-based voice-capable router):

- Independent Mode: A configuration parameter determines the single coder to use in the profile, or:
- In slave mode. The coder to use is determined according to the one used by the voice gateway (default mode). Thus, if modem detection is implemented in the voice gateway, the modem can select the G.711 coder that will be used by the voice gateway with the access device (in slave mode) detecting the coder change.

Thus, several telephone applications are supported:

- Voice: A low bit rate coder can be used.
- FAX: Preferably the G.711 coder will be used. However, a FAX communication with a bit rate lower than 9600 bps will be achieved with an ADPCM coder (32Kbps G.726).
- Modem: The G.711 coder must be used.
- Data (e.g. H.320 videoconferencing): The voice gateway can notify the access device, the call type, (voice, modem, and data) during the allocation of the CID. If the call type cannot be identified, a specific profile (transparent CES) can be configured for the voice port but will be applied to all the communications on this port.

#### 2.1.1.3 Transport over ATM

Signaling and voice flows are multiplexed in one ATM VC by the ATM Adaptation Layer 2 (AAL2). Each channel is identified by a CID (Channel Identifier). A S0 interface requires 3 CID (1 for the D channel and 1 for each B channel). An analog interface requires 1 CID. The ELCP protocol (CID allocation or port control for BRI and PRI) requires a specific CID. For BRI and PRI, the CID assignment to the voice interfaces can be either static or dynamic. In the latter case, the ELCP protocol, specified in the BLES standard, is used (in the specific CID number 8). The voice ports are identified by a single number (1 to N) in order to enable the voice gateway to identify each subscriber (for incoming and outgoing calls). In case of static allocation, the following standardized values are used:

1. ELCP and PSTN signaling (CCS) is not supported for analog ports. The Gateway must be configured in CAS mode without ELCP.
2. ELCP is not supported in VTOA mode. All the CIDs (for each time slot) are defined in the configuration. ELCP is mandatory in BLES mode for PRI and recommended for BRI.

| CID      | V5 and ELCP          |
|----------|----------------------|
| 16..127  | Analog interface FXS |
| 128..159 | ISDN D Channels      |
| 160..223 | ISDN B Channels      |

Example: The S0 port n°1 has the CID 128,160,161 for the channels D, B1, and B2. The S0 port n°2 has the CID 129,162,163.

The adaptation layer AAL2 optionally enables multiplexing of several voice payloads in one ATM cell coming from one or more channels. This operating mode enables the reduction of bandwidth by optimizing the filling of ATM cells (fixed length of 53 bytes) when using a low bit rate coder such as G.729. A timer is defined for the cell emission. If the timer elapses, and no additional voice payload is to be sent to fully fill the ATM cell, then the cell is emitted, even if it is only partially filled. The voice payload length recommended by the BLES/VTOA standard is defined to minimize the ATM cell padding which results in greater efficiency with G.711 and G.726/G.732 coders without requiring cell multiplexing.

The ATM bandwidth required by voice thus depends on many parameters:

- Type of coder for each port
- Filling rate of ATM cells (determined by the length of the voice payloads and AAL2 mode multiplexed or not)
- Signaling traffic (ELCP, V5, ISDN/Canal D)

The ATM Class of Service required by the AAL2 PVC is at least VBR-RT (or CBR). The voice frames must be transmitted with higher priority than cells dedicated to data transfers in order to reduce network jitter and transit delay for voice. The PCR (Peak Cell Rate) must be assigned in consideration of the worst case in order to minimize cell loss. Signaling flows however will be considered as limited.

The PVC PCR will be calculated according to the following data:

| Channel               | PCR (cells/second) | ATM bit rate (bit/second) |
|-----------------------|--------------------|---------------------------|
| Voice G.711 / 5ms     | 200                | 84800                     |
| Voice G.711 / 5.5ms   | 182                | 77168                     |
| Voice G.726-32 / 10ms | 100                | 42400                     |
| Voice G.726-32 / 11ms | 91                 | 38584                     |
| D channel S0          | 5                  | 2120                      |
| D channel S2          | 50                 | 21200                     |
| ELCP signaling (S0)   | 5                  | 2120                      |
| ELCP signaling (S2)   | 50                 | 21200                     |

Example: Handling 4 S0 ports with G.711/5.5ms requires a PCR of 1481 cells per second (cps), which is a rate of 627944 bps). With G.726 coding mode, the PCR would be 753 cps (ATM rate of 319272 bps).

Most of the time average voice traffic is lower than the PCR. The telephone calls are not all permanently established. Silence detection enables reduction in bandwidth requirement by 50% during communications.

Note: There is no consistency check between the configured PCR and the ATM bandwidth required for all the communications. If the PCR is too low, cells will be lost on the uplink.

### 2.1.2 Circuit Emulation Service

The Circuit Emulation Service uses AAL1 for the E1 transport through the ATM network. The ONE400/200 is fully transparent. Consequently, neither voice encoding nor echo cancellation is performed. The optional DSP board is not required.

Two modes are supported:

- Structured: this mode enables the transport of N time slots (Nx64Kbps, N=1 to 31). The time-slot 0 must not be transported.
- Unstructured: this mode allows the transport of a full E1 (2048Kbps) without G.704 processing. The time-slot 0 is transported transparently.

In structured mode, in case of a low bit rate value (for example 2x64Kbps), the transit delay may be important (due to the time required for full ATM cell filling). For voice application, a high round-trip delay may require an echo-canceller. The ONE400/200 supports the "partial fill mode" that enables to send an ATM cell without waiting it is filled of data coming from the user. This method reduces the transit delay but a higher bandwidth is required on ATM. In partial fill mode, it is possible to configure the number of E1 frames per cell, and to disable the AAL1 structure pointer.

The CES can be offered on a serial interface for an nx64Kbps bit rate (64Kbps to 2048 Kbps). The AAL1 cell format is identical to the structured mode (nx64Kbps) or unstructured mode (2048Kbps). The Command & Indication (C&I or 105/109) signals can be optionally transmitted: the Command signal enables the transmit flow; the Indication state is defined by the AAL1 synchronization state.

ATM bandwidth required (no partial fill mode):

| E1 Rate | ATM Rate (Kbps) | Max Delay (bit/second) |
|---------|-----------------|------------------------|
| 64      | 73              | 18                     |
| 128     | 145             | 11                     |
| 256     | 289             | 9                      |
| 512     | 578             | 8.5                    |
| 1024    | 1156            | 8                      |
| 1920    | 2167            | 8                      |
| 2048    | 2311            | 8                      |

The Max delay is "one-way" and end-to-end with two ONE200 devices, with a jitter configured at 4 ms (vtoa-connection) for 128kbps to 2048kbps and 8 ms for 64Kbps E1 rate. The ATM and DSL delays are not included in the calculation.

Note: There is no consistency check between the configured PCR for the ATM PVC and the bandwidth required for AAL1. If the PCR is too low, cells will be lost on the uplink.

### 2.1.3 Synchronization

It is necessary to synchronize the OneOS-based voice-capable router to a clock retrieved from the voice gateway. If the correct synchronization is not achieved, problems may occur specifically for Modem/FAX or CES communications. The voice gateway is usually connected to the switched telephone network and is synchronized to the PSTN clock reference. Four methods are possible:

- From the voice cell flow received from the voice gateway (located in the CO). This method, configured by default, is recommended by the standard (BLES, CES). The OneOS-based voice-capable router selects the ATM (AAL2 or AAL1) connection according to a priority defined in configuration.
- From the DSL clock
- From an internal clock
- For PRI only: On the E1 interface configured in slave mode. This case assumes that the PBX is connected to the PSTN (with another PRI interface) and therefore delivers a clock synchronized to the PSTN.
- For serial CES only: on the clock signal received on the serial port (DTE mode).

### 2.1.4 Main Parameters

The following parameters must be known before configuring and installing the voice BLES function:

ATM Parameters

- VP identifier
- VC identifier

- PCR (Peak Cell Rate) guaranteed by the Local Exchange Carrier operator. If unknown, it will be assigned according to the number of ports as indicated above.
- Class of Service offered by the operator: VBR-rt or CBR.

#### BLES Protocol

- Type and identification of the voice interfaces
- Assignment of the CID: static or dynamic with ELCP
- ATM profile for each voice port
- Independent or slave mode for the selection of the coder

#### VTOA Protocol

- ATM profile for each voice port
- Independent or slave mode for the selection of the coder

#### CES

- AAL1 parameters: partial fill, use of AAL1 structure pointer

#### Voice Interface

- Echo cancellation: Disabled or enabled. When enabled the echo tail length must be provided. The echo cancellation may be turned off automatically upon detection of a Modem/FAX (configurable: the device can be forced not to detect modem/fax). For phone calls, it must be activated with a long tail length if the subscriber calls off-net, or short length, if the subscriber is connected locally. Warning: the echo cancellation cannot be enabled for CES.
- FAX application or modem: Assure that the configured profile supports this type of communication (profiles 7,8,9) or that the voice gateway can switch to G.711 when detecting FAX or modem
- Data application: Assure that the voice gateway (CO) supports this type of application in accordance with the BLES standard (indication in the CID allocation).

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## 2.2 VOATM & CES CONFIGURATION

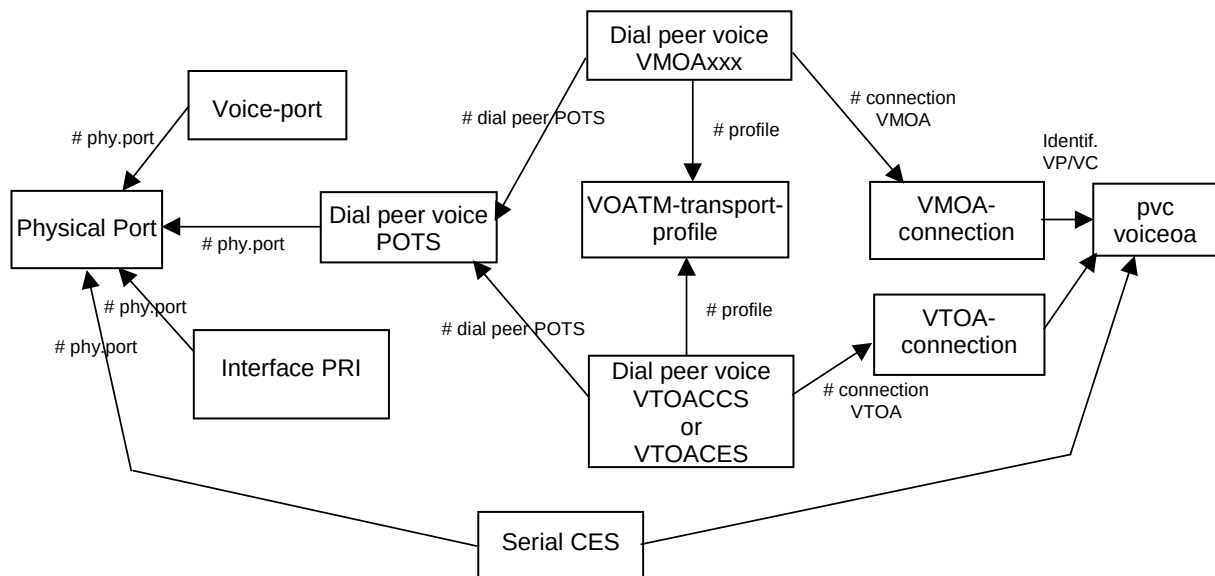
### 2.2.1 Introduction

A set of command lines (CLI), dedicated to voice service enables the configuration of all necessary parameters. In general, the BLES function requires the configuration of very few parameters. The OneOS-based voice-capable router permits the configuration of a comprehensive set of parameter in order to adapt to all cases depicted in the Standards. Most parameters will be set with their default values, thereby reducing the number of steps required to configure the device.

The configuration includes the following main commands:

- `voice-port`: Physical S0/S2/FXS port. Voice processing parameters are defined such as echo cancellation, gain and the coding law.
- `interface`: Defines, for PRI/S2 and serial CES only, parameters for the E1/T1 physical level or the serial interface management.
- `dial-peer voice`: Logical internal ports.
- `pots`: Local voice port always associated with a physical port. It enables the configuration of protocol-specific parameters such as the bearer service voice/modem/data, etc.
- `vmoabri`: Internal S0 ports connected to a remote voice gateway in BLES mode, which must be associated with a dial-peer voice POTS (that is in turn associated with a physical S0 port). It configures parameters specific to the BLES standard: port identifier, profiles, ATM connection, CID.
- `vmoapri`: Similar to `vmoabri`, for S2 interface.
- `vmoafx`: Similar to `vmoabri`, for analog interface.
- `vtoaccs`: It defines an E1 port handled in trunking mode.
- `vtoaces`: It defines an E1/T1 port processed by the CES function.
- `vmoa-connection`: Defines a connection to a voice gateway offering BLES service. It defines VP/VC, jitter and parameters of ELCP protocol. It is possible to define several VP/VC connections towards one or more voice gateways.
- `vtoa-connection`: Defines a connection to a voice gateway offering a voice over ATM service in trunking mode.
- `voatm-transport-profile`: Defines voice transport profiles. Enables the modification of standardized profiles or creation of a customized profile. By default, the standardized profiles are configured.
- `pvc voiceoa (interface atm)`: Defines the ATM VP/VC and AAL2 parameters (e.g. multiplexing mode).

The relationships between configuration items are described on the following diagram:



The following sequence for configuration is preferred:

1. PVC voiceoa
2. interface if PRI or Serial CES
3. VMOA or VTOA connection (voice application only)
4. voice ports (except serial port) (voice application only)
5. Dial Peer Voice POTS (voice application only)
6. voatm profile (voice application only)
7. Dial Peer Voice vmoabri, vmoafx, vmoapri, vtoaccs or vtoaces (voice application only)

### 2.2.2 Configuration Management

Most of the parameters may be changed and applied without rebooting the device. However, some parameters pertaining to the ports managed by the remote BLES voice gateway require shutting down the global connection to the gateway for any change. To build a new configuration, it is more efficient to copy the configuration samples given in this chapter into a text file (startup-config), then change the required parameters and download the file into the device.

After entering configuration commands, the `show voice running-config` command provides the differences between the default configuration and the running configuration in a CLI command format.

To save the voice configuration and transfer it to another device, it is then easy to copy and paste the voice configuration into a text file and insert it into the configuration file of another device.

### 2.2.3 Physical Voice Ports

The voice module of the OneOS-based voice-capable router is always designated by the number 5. The physical voice port is identified with a port number in the  $[0..(n-1)]$  range, where  $n$  is the total port number of the interface module (currently from up to 13).

The command for the creation of the physical port number 0 (voice module number 5):

```
CLI(configure)> voice-port 5/0
```

To enable (or disable) the echo canceller - default: enabled. - use the following command.

```
CLI(voice-port)> [no] echo-cancellation
```

To define the maximum tail length ('low' is 8ms, 'medium' is 16ms, 'high' is 32 ms) - default 'medium' -, use the following command. It must be configured Medium or High if off-net calls must be supported.

```
CLI(voice-port)> [no] echo-cancellation-length { low | medium | high }
```

**On ONE300, when using G.729 codec, 30 voice channels can only be supported if echo-cancellation low or medium is selected.**

To specify the conditions for automatically disabling the echo canceller on FAX or modem detection, use the following command. Default: no echo disabling. Please refer to the table in "Parameters for Echo Cancellation" section of "VoIP: Physical Voice Ports Configuration" chapter in "OneOS – VoIP User Guide" document for the explanation of the parameter.

```
CLI(voice-port)> [no] echo-disable { voicemodem | modem }
```

To set the output gain (dB) - default: 0 dB - and amplify the voice signal sent out the port (e.g. to PABX):

```
CLI(voice-port)> output-gain <gain>
```

To set the input gain (dB) - default: 0 dB - and amplify the voice signal received on the port (e.g. from PABX):

```
CLI(voice-port)> input-gain <gain>
```

To select the synchronization input (default: aal2):

```
CLI(voice-port)> clock-source { aal2 | aal1 | free-run | uplink | bri
                                | pri }
```

The modification is automatically applied to all voice ports as a unique clock source must be used.

To define the ring signal parameters, for analog ports only, use the following command. The frequency used is compliant to the listed countries specifications (note that the timing parameters - ringing and silence periods - are not used). The ringing state is directly done by the CO in CAS mode.

```
CLI(voice-port)> ring { France | Germany | USA | Italy | Spain | UK
                       | userdefined }
```

To define the ringing parameters for the userdefined ringing profile, use the following command. Only the frequency is significant (the timing parameters are defined by the CO in CAS mode).

```
CLI(voice-port)> user-ring <parameter list>
```

To define the ringing voltage, for analog ports only, use the following command (default: normal).

```
CLI(voice-port)> ring-level { normal | high | max }
```

Please refer to "Parameters for ringing (analog ports only)" section in "Analog ports specific parameters" chapter of "OneOS – VoIP User Guide" document for more information about the available ring levels.

Example:

```
output-gain 7
ring-level max
user-ring 55 1000 1000 1000 1000
ring userdefined
```

## 2.2.4 PRI Interface

If a PRI interface is used, it must be enabled by entering the following commands that allow specifying several parameters for the physical level.

Example of commands for enabling an E1 interface on physical port number 0 (voice module number 5):

```
interface pri 5/0
physical-interface E1
linecode hdb3
```

Main parameters:

To specify the interface type of voice interface as E1 or T1 - default: E1 -:

```
CLI(config-if)> physical-interface { e1 | e1 }
```

To specify the framing type:

```
CLI(config-if)> framing { none | df | mf | emf | sf | esf | auto-detect }
```

- none: no framing. Only used for CES / unstructured mode
- df: double frame (no CRC4). For E1 only. (Default value)
- mf: multiframe (CRC4). For E1 only
- emf: extended multiframe (CRC4). For E1 only
- sf: super-frame (for T1 only)
- esf: extended super frame (for T1 only)
- auto-detect: used to find automatically ISDN PRI framing by trying all possible detections. This behavior can be set when the configuration of remote side is unknown. An event containing the correct framing is generated when layer-1 is activated.

To specify the physical line coding to be used - default: hdb3 -:

```
CLI(config-if)> linecode { ami | hdb3 | bz8s }
```

The interface must be shut down if a physical parameter has to be modified. The interface is re-activated with the no shutdown command.

```
CLI(config-if)> [no] shutdown
```

## 2.2.5 Serial CES Interface

If a serial interface is used for CES, it must be enabled by entering the following commands that specify several parameters for the physical level.

Commands for enabling a serial interface on serial port number 0:

```
interface serial-ces 0/0  
clock-source aal1  
input-command STD tx  
output-indication STD rx  
atm-pvc VGW  
bit-rate 512000
```

Main parameters:

To define the clock source, use the following command. serial is used if DTE mode is configured (detected via cable). When serial is selected and the port configured in DCE, the aal1 clock-source is automatically selected. uplink indicates that the device clock is synchronized on the physical level of the DSL uplink. aal1 means that the clock is recovered using the adaptive recovery method, which computes clock based on the AAL-1 arrival rate. free-run indicates that the clock is generated by an internal device clock generator.

```
CLI(config-if)> clock-source { aal1 | free-run | serial | uplink }
```

To define how to manage the C/105 signal (DCE mode) or the I/109 signal (DTE mode), use the following command. The first parameter defines if the signal is forced (on, off) or not. The normal value is std (standard behavior); on and off are for testing purpose only. The second parameter defines how AAL1 flow transmission is managed depending on 105 signal state. When tx is selected, AAL-1 cells are sent only when 105 is ON; when 105 is OFF, AAL-1 cells are not sent. When no-tx is selected, AAL-1 cells are sent without verifying the 105-signal state. Default value: std tx.

```
CLI(config-if)> input-command { off | on | std } { tx | no-tx }
```

To define how to manage the I/109 signal (DCE mode) or the C/105 signal (DTE mode), use the following command. The first parameter defines if the signal is forced (on, off) or not. The second parameter defines how the 109 signal is managed depending on the AAL1 flow reception status. When no AAL-1 cells are received and the configured value is `std rx`, the 109 signal is forced off while no AAL-1 cells are received. Otherwise, the 109 signal is set on. When `no-rx` is selected, the 109 signal does not depend on the AAL-1 reception status. Default values: `std rx`.

```
CLI(config-if)> output-indication { off | on | std } { rx | no-rx }
```

To specify the bit rate, use the following command. In DTE mode, if the received clock is different from the configured bit rate, error events may occur and the service will not be operational.

```
CLI(config-if)> bit-rate { 64000 | 128000 | ... | 2048000 }
```

The maximum network jitter can be compensated by the OneOS-based voice-capable router (default 30ms). The jitter command subsequently configures the jitter buffer length. The jitter buffer length is provided in milliseconds.

```
CLI(config-if)> jitter <lenght_in_ms>
```

To specify the PVC VOICEOA to be used, use the following command.

```
CLI(config-if)> atm-pvc <vcd>
```

To disable the CES port, use the following command. This command must be used for modification of `atm-pvc`, `jitter`, `bit-rate` parameters. Use `no shutdown` to re-enable the CES port.

```
CLI(config-if)> [no] shutdown
```

Note:

- If voice ports are also configured, the selected clock-source will be applied to all the voice and CES ports (there is a single clock source for all the voice and serial CES ports).
- All the other output signals (108/107, 106) are set to ON except if the port is shutdown.

### 2.2.5.1 Loopback Commands

The loopback commands are entered when the CLI is in the `serial-ces` menu. To do so, enter:

```
CLI(configure)> interface serial-ces 0/0
```

For troubleshooting, loopback commands are used to identify, which side of the connection is faulty.

A loopback on the serial interface returns incoming data to the serial interface output. Incoming AAL-1 cells are dropped and outgoing AAL-1 cells are filled with all-ones to perform trunk conditioning. The command for serial interface loopback is:

```
CLI(configure)> loop serial
```

A loopback on the ATM side returns data processed through the CES function to the incoming PVC. Incoming data on the serial port is dropped. Outgoing data on the serial port is a series of all-ones. The command for ATM CES loopback is:

```
CLI(config-if)> loop atm-ces
```

The `no loop` command removes the serial or ATM CES interface loopback. Both loopback commands cannot be used simultaneously.

### 2.2.6 Internal Local Voice Port (POTS)

The command for the creation of a local POTS port associated with the physical port `p` is:

```
CLI(configure)> dial-peer voice pots <n>  
CLI(pots)> port <p>
```

Each `dial-peer voice pots` must be identified by an arbitrary index `n` from 1 to N.

### 2.2.7 Voice over ATM PVC

An ATM PVC must be created to support the transport of voice and signaling over ATM. The following example creates a PVC with VP=2, VC=32 towards the voice gateway. The PVC is identified with an arbitrary name vgw and uses a CBR Class of Service with a PCR at 160000 bps.

```
interface atm 0.2
  pvc voiceoa vpi 2 vci 32 vgw
    qos cbr pcr 160000
    priority 1
  execute
```

List of commands and parameters:

A specific sub-interface must be defined for a voice PVC.

```
CLI(configure)> interface atm <physical>.<sub-interface>
```

To specify the VP/VC to be used and define the identifier used by the other voice commands.

```
CLI(config-if)> pvc voiceoa vpi <vpi-id> vci <vci-id> <identifier>
```

To specify the Class of Service (CBR or VBR-RT) and the PCR (Peak Cell Rate) in bps, use the following command. The Class of Service must always be specified.

```
CLI(voiceoa)> qos { cbr | vbr-rt } pcr <pcr-value>
```

To specify the priority for transmission, use the following command. It must be set to 1 for voice PVC.

```
CLI(voiceoa)> priority <priority>
```

To enable the multiplexed mode for AAL2 (default: no timer-cu), use the following command. The value in ms is the time to wait another voice payload for multiplexing before sending the AAL-2 frame.

```
CLI(voiceoa)> [no] timer-cu <milliseconds>
```

To specify the ATM AAL type, use the following command (default: AAL2).

```
CLI(voiceoa)> type { aal1 | aal2 }
```

To specify the structured format for AAL1, use the following command.

```
CLI(voiceoa)> structured { pf | no-pf } [length <1-47>] { pointer
| no-pointer }
```

- pf: partial fill (default: no partial fill)

- length: is the maximum number of E1/T1 frames in each AAL1 payload (partial fill mode only). The default value is 1. There is no consistency check on this value: the final value will be the minimum value between this parameter and the possible length depending on the number of time-slots (configured in dial-peer voice vtoaccs).

- pointer: is the optional AAL1 structure pointer. Mandatory if partial fill is disabled. (Default: pointer).

To specify the unstructured mode for AAL1, use the following command. Default value: structured no-pf pointer.

```
CLI(voiceoa)> no structured
```

To specify the time-out of non cell reception to consider the AAL1 connection as out of service, use the following command. Default: 2500 ms.

```
CLI(voiceoa)> cell-loss-integ-period <1000..65000 ms>
```

The following command must be entered for validation of the parameters.

```
CLI(voiceoa)> execute
```

### 2.2.8 VMOA/BLES Connection

In the following example, the VMOA connection is created and associated to the PVC identified by the name vgw:

```
CLI(configure)> vmoa-connection 1
CLI(vmoa)> atm-pvc vgw
CLI(vmoa)>
```

The modification of some parameters requires deactivation of the connection: command shutdown when the prompt is CLI(vmoa)>. Then enter command no shutdown to activate it after modification.

Main Parameters:

To specify the maximum network jitter that can be compensated by the OneOS-Based voice-capable router, enter the following command (default 30ms). The jitter command subsequently configures the jitter buffer length.

```
CLI(vmoa)> jitter <buffer-length-in-milliseconds>
```

To enable ELCP-CAP (Channel Allocation Procedure) - default: enabled, enter the following command:

```
CLI(vmoa)> les-cap { enabled | disabled }
```

To enable ELCP-Control (Port Control Procedure) - default: enabled, enter the following command:

```
CLI(vmoa)> les-common-control { enabled | disabled }
```

To allow configuration of the mode for the voice coder selection in the profile, slave or independent - default: no, meaning slave mode -, enter the following command:

```
CLI(vmoa)> coder-mode-independent { yes | no }
```

To select the activity detection before sending packets, use the following command. The OneOS-Based voice-capable router begins sending frames when it receives frames. It is recommended to configure 'yes' if ELCP and silence detection are not used to avoid the transmission of voice packets when the communication is not established. Default: no.

```
CLI(vmoa)> implicit-channel-act { yes | no }
```

To define the minimum time without receiving frames before deactivation of the transmission - related to the implicit activation -, use the following command. Default: 300ms.

```
CLI(vmoa)> deactivation-timer <milliseconds>
```

The VMOA connection is deactivated by default and, if activated, must be deactivated for configuration modification. Use the no form of the following command to activate or reactivate the VMOA connection. Use the following command to deactivate the VMOA connection.

```
CLI(vmoa)> shutdown
```

To activate or deactivate the ELCP protocol, both les-cap and les-common-control must be enabled or disabled.

### 2.2.9 VTOA Connection

In the following example, the VTOA connection is created and associated with the PVC identified by the name vgw:

```
CLI(configure)> vtoa-connection 1
CLI(vtoa)> atm-pvc vgw
CLI(vtoa)>
```

The modification of some parameters requires deactivation of the connection: command shutdown when the prompt is CLI(vtoa)>. Then enter command no shutdown to activate it after modification.

**Main Parameters:**

To specify the maximum network jitter that can be compensated by the OneOS-Based voice-capable router, enter the following command (default 30ms). The jitter command subsequently configures the jitter buffer length.

```
CLI(vtoa)> jitter <buffer-length-in-milliseconds>
```

To select the activity detection before sending packets, use the following command. The OneOS-Based voice-capable router begins sending frames when it receives frames. Default: no.

```
CLI(vtoa)> implicit-channel-act { yes | no }
```

To define the minimum time without receiving frames before deactivation of the transmission - related to the implicit activation -, use the following command. Default: 300ms.

```
CLI(vtoa)> deactivation-timer <milliseconds>
```

The VTOA connection is deactivated by default and, if activated, must be deactivated for configuration modification. Use the no form of the following command to activate or reactivate the VTOA connection. Use the following command to deactivate the VTOA connection.

```
CLI(vtoa)> shutdown
```

**2.2.10 ATM Transport Profile**

The following profiles are pre-configured (the voice packet length in bytes is given between brackets and is followed by the UUI ranges):

| Ident. | Name            | Coder 0         | Coder 1            | Coder 2            | Silence Detection |
|--------|-----------------|-----------------|--------------------|--------------------|-------------------|
| 0      | ATM Forum n°7   | G.711 (44) 0-7  | G.726-32 (44) 8-15 | -                  | Yes 0-7           |
| 1      | ATM Forum n°8   | G.711 (44) 0-15 | -                  | -                  | Yes 0-15          |
| 2      | ATM Forum n°9   | G.711 (44) 0-15 | -                  | -                  | No                |
| 3      | ATM Forum n°10  | G.711 (44) 0-7  | G.726-32 (44) 8-15 | -                  | No                |
| 4      | ATM Forum n°11  | G.711 (40) 0-7  | G.726-32 (40) 8-15 | -                  | No                |
| 5      | ATM Forum n°12  | G.711 (40) 0-7  | G.726-32 (40) 8-15 | -                  | Yes 0-7           |
| 6      | ITU I366.2 n°1  | G.711 (40) 0-15 | -                  | -                  | No                |
| 7      | ITU I366.2 n°2  | G.711 (40) 0-15 | -                  | -                  | Yes               |
| 8      | ITU I366.2 n°13 | G.711 (40) 0-7  | G.726-32 (40) 8-15 | G.726-32 (20) 8-15 | Yes 0-15          |
| 9      | Specific CES-44 | CES (44) 0-15   | -                  | -                  | No                |
| 10     | Specific CES-40 | CES (40) 0-15   | -                  | -                  | No                |

The coder by default is coder 0. When in independent mode it is possible to select another coder by modifying the standardized profile. It is also possible to create a new profile identical to one of the standardized profiles but with the coder by default different from 0.

Example of a profile identical to ATM Forum n°7 with G.726 as default coder instead of G.711:

```
CLI(configure)> voatm-transport-profile 3
CLI(voatm-trans)> coder-profile ATMF7 1 a-law
```

**Parameters:**

```
CLI(voatm-trans)> coder-profile <profile-id> <index> <coding-law>
```

profile-id indicates the profile to be used (ATMFx or userdefined), index specifies the coder to be used, coding-law specifies a-law or u-law in case of G.711.

To enable silence detection on the transmitted flow (phone to voice gateway) - if the selected profile allows it -, use the following command. If vad is configured, simple silence packets are sent. If vadcng is configured, the received noise level is indicated in the silence frames. Default: disabled. To disable silence detection, use the no silence-detection command.

```
CLI(voatm-trans)> silence-detection { vad | vadcng }
```

To create a specific profile, the userdefined profile must be selected. The coders are configured with the user-coder command. For example:

```
voatm-transport-profile 4
coder-profile userdefined 1
user-coder 0-3 g711a-64 5500 5500 1
user-coder 4-7 g726-32 11000 5500 1
```

```
CLI> user-coder <UUI-range> <coder> <packet-time> <seq-number-interval>
                                     <M(nb-of-SDU/packet)>
```

The command parameters are:

- **UUI range**: Specifies the UUI range for this coder (0-3,4-7,7-11,11-15,0-7,8-15,0-15)
- **coder**: g711generic-64, g711a-64, g711u-64, g726-32, g726-40, SID. If g711generic-64 is selected, the coding law (a-law / u-law) must be configured in the coder-profile command. SID is used for the silence packets.
- **packet-time**: Period for each voice packet in us (ex 5500 for 5.5 ms)
- **seq-number-interval**: Time between each sequence number
- **<M>**: Number of SDU in each packet.

The index value for the coder is determined automatically while configuring the user-coder command (the first user-coder entered is number 0, the following user coder entered is number 1). To modify one of the coders, the command no user-coder must be entered (warning: all the coders will be deleted).

For more details about the profile parameters, read the ATM Forum standard AF-VMOA-145 Annex A.

### 2.2.11 Internal VMOA BRI Port

An internal VMOA BRI port is created and is referenced with an arbitrary number that starts from one to N (N=number of ports).

A "dial-peer voice POTS" is associated with the VMOA BRI port. This operation associates a port to the voice gateway with a local port linked to a physical voice port.

The creation of a VMOA ISDN port is as follows:

```
dial-peer voice VMOABRI 1
dial-peer-voice-pots 1
vmoaport 1
vmoa-connection-id 1
```

Commands and Parameters:

To specify the identifier of the associated local port (mandatory):

```
CLI(vmoabri)> dial-peer-voice-pots <port>
```

To specify the standardized BLES port number in accordance with the CO-IWF (mandatory):

```
CLI(vmoabri)> vmoaport <bles-port-number>
```

To specify the ATM/VMOA connection identifier (mandatory):

```
CLI(vmoabri)> vmoa-connection-id <cid-value>
```

To define the ATM profile to be used (default: 0):

```
CLI(vmoabri)> voatm-transport-profile <profile-index>
```

To define the Channel ID for the D channel if ELCP is deactivated (default port nb+127):

```
CLI(vmoabri)> cid-d <cid-d-value>
```

To define the Channel ID for B1 channel if ELCP is deactivated (default (port nb-1)x2+160):

```
CLI(vmoabri)> cid-b1 <cid-b1-value>
```

To define the Channel ID for B2 channel if ELCP is deactivated (default (port nb-1)x2+161):

```
CLI(vmoabri)> cid-b2 <cid-b2-value>
```

The following command is used for port blocking according to the BLES standard (if ELCP is used). The port is unblocked using the `no shutdown` command.

```
CLI(vmoabri)> [no] shutdown
```

Warning: If a parameter must be modified, the associated VMOA connection must be shut down first.

### 2.2.12 Internal VMOA PRI Port

An internal VMOA PRI port is created and is referenced with an arbitrary number that starts from one to N (N=number of ports).

A "dial-peer voice POTS" is associated with the VMOA PRI port. This operation associates a port to the voice gateway with a local port linked to a physical voice port.

The creation of a VMOA PRI port is as follows:

```
CLI(configure)> dial-peer voice VMOAPRI 1
CLI(vmoapri)> dial-peer-voice-pots 1
CLI(vmoapri)> vmoaport 1
CLI(vmoapri)> vmoa-connection-id 1
```

Commands and parameters:

To specify the identifier of the associated local port (mandatory):

```
CLI(vmoapri)> dial-peer-voice-pots <port>
```

To specify the standardized BLES port number in accordance with the CO-IWF (mandatory):

```
CLI(vmoapri)> vmoaport <bles-port-number>
```

To specify the ATM/VMOA connection identifier (mandatory):

```
CLI(vmoapri)> vmoa-connection-id <cid-value>
```

To define the ATM profile to be used (default: 0):

```
CLI(vmoapri)> voatm-transport-profile <profile-index>
```

The following command is used for port blocking according to the BLES standard (if ELCP is used). The port is unblocked using the `no shutdown` command.

```
CLI(vmoapri)> [no] shutdown
```

Warning: If a parameter must be modified, the associated VMOA connection must be shut down first.

ELCP must be used on the corresponding VMOA connection. It is then impossible to specify any fixed CID for the D and B channels.

### 2.2.13 Internal VTOA CCS Port

An internal VTOACCS (E1) port is created and is referenced with an arbitrary number that starts from one to N (N=number of ports). A "dial-peer-voice-pots" is associated with the VTOACCS port. This operation associates a port to the voice gateway with a local port linked to a physical voice port.

The creation of a VTOACCS port is as follows:

```
CLI(configure)> dial-peer voice VTOACCS 1
CLI(vtoaccs)> dial-peer-voice-pots 1
CLI(vtoaccs)> vtoa-connection-id 1
```

Commands and Parameters:

To specify the identifier of the associated local port (mandatory); the local port must be PRI:

```
CLI(vtoaccs)> dial-peer-voice-pots <port>
```

To specify the ATM/VTOA connection identifier (mandatory):

```
CLI(vtoaccs)> vtoa-connection-id <cid-value>
```

To define the ATM profile to be used (default: 0):

```
CLI(vtoaccs)> voatm-transport-profile <profile-index>
```

To define a CID for a time slot (1 to 31) and the type (voice or signaling), - only one time slot with a signaling type may be configured -:

```
CLI(vtoaccs)> cid <timeslot> {sig | voice} <cid-value>
```

The following command is used for port blocking according to the BLES standard. The port is unblocked using the no shutdown command.

```
CLI(vtoaccs)> [no] shutdown
```

Warning: If a parameter must be modified, the associated VTOA connection must be shut down first.

## 2.2.14 Internal VTOA CES Port

An internal VTOACES (E1/T1) port is created and is referenced with an arbitrary number that starts from one to N (N=number of ports). A "dial-peer-voice-pots" is associated with the VTOACES port. In this operation, a port to the voice gateway or ATM switch is associated with a local port linked to a physical voice port.

The creation of a VTOACES port is done as follows:

```
CLI(configure)> dial-peer voice VTOACES 1
CLI(vtoaccs)> dial-peer-voice-pots 1
CLI(vtoaccs)> vtoa-connection-id 1
```

Commands and Parameters:

To specify the identifier of the associated local port (mandatory); the local port must be PRI:

```
CLI(vtoaccs)> dial-peer-voice-pots <port>
```

To specify the ATM/VTOA connection identifier (mandatory):

```
CLI(vtoaccs)> vtoa-connection-id <cid-value>
```

To specify a time slot range of the E1/T1 interface, use the following command. Several ts commands can be specified (e.g. 1-8, 16-23...). For one time slot only, ts max is optional. These parameters are ignored if the unstructured mode is selected in the AAL1 PVC.

```
CLI(vtoaccs)> ts <ts min> [<ts max>]
```

The following command is used for port blocking according to the BLES standard. The port is unblocked using the no shutdown command.

```
CLI(vtoaccs)> [no] shutdown
```

Warning: If a parameter must be modified, the associated VTOA connection must be shut down first.

### 2.2.14.1 Loopback Commands

The loopback commands are entered when the CLI is in the E1 CES menu. To do so, enter:

```
CLI(configure)> dial-peer voice VTOACES 1
```

For troubleshooting, loopback commands are used to identify, which side of the connection is faulty.

A loopback on the PRI interface returns incoming data to the PRI interface output. Incoming AAL-1 cells are dropped and outgoing AAL-1 cells are filled with all-ones to perform trunk conditioning. The command for PRI interface loopback is the following - the no form removes the PRI interface loopback -:

```
CLI(vtoaccs)> [no] loop pri
```

A loopback on the ATM side returns data passing through the CES function to the incoming PVC. Incoming data on the PRI interface is dropped. Outgoing data on the PRI interface is a series of all-ones. The command for ATM CES loopback is the following - the no form removes the ATM CES loopback -:

```
CLI(vtoacss)> loop atm-ces
```

Both loopback commands cannot be used simultaneously.

### 2.2.15 Internal VMOA FXS Port

An internal VMOA FXS port is created and is referenced with an arbitrary number that starts from one to N (N=number of ports).

A "dial-peer voice POTS" is associated with the VMOA FXS port. This operation associates a port to the voice gateway with a local port itself linked to a physical voice port.

The creation of a VMOA FXS port is as follows:

```
dial-peer voice vmoafx 1
dial-peer-voice-pots 1
vmoaport 1
cid 16
vmoa-connection-id 1
```

Commands and parameters:

To specify the identifier of the associated local port (mandatory):

```
CLI(vmoafx)> dial-peer-voice-pots <port>
```

To specify the standardized BLES port number in accordance with the CO-IWF (mandatory):

```
CLI(vmoafx)> vmoaport <bles-port-number>
```

To specify the ATM/VMOA connection identifier (mandatory):

```
CLI(vmoafx)> vmoa-connection-id <cid-value>
```

To define the ATM profile to be used (default: 0):

```
CLI(vmoafx)> voatm-transport-profile <profile-index>
```

To define the channel id:

```
CLI(vmoafx)> cid <cid-value>
```

The following command is used for port blocking. The port is unblocked using the no shutdown command.

```
CLI(vmoafx)> shutdown
```

Warning: If a parameter must be modified, the associated VMOA connection must be shut down first.

---

## 2.3 VOATM & CES CONFIGURATION EXAMPLE

To use these configuration examples, copy & paste the following commands lists in a configuration file or to the CLI.

### 2.3.1 BLES example

The complete configuration for 4 S0 ports over a VP/VC=2/32 and ATM profile #7 with ELCP is the following:

```

! ATM PVC configuration
interface atm 0.2
pvc voiceoa vpi 2 vci 32 VGW
qos cbr pcr 150000
execute
exit
exit

! Physical voice ports declaration
voice-port 5/0
exit
voice-port 5/1
exit
voice-port 5/2
exit
voice-port 5/3
exit

! local voice ports
dial-peer voice POTS 0
port 5/0
exit
dial-peer voice POTS 1
port 5/1
exit
dial-peer voice POTS 2
port 5/2
exit
dial-peer voice POTS 3
port 5/3
exit

! BLES connection configuration (disabled by default)
VMOA-connection 0
atm-pvc VGW
jitter 30
les-common-control
les-cap
exit

! Voice over ATM profile configuration
VOATM-transport-profile 0
coder-profile coder-profile ATMF7 1 a-law
exit

! BLES ports configuration
dial-peer voice VMOABRI 0
VMOAport 1
VOATM-transport-profile 0
dial-peer-voice-POTS 0
VMOA-connection-id 0

```

```

exit
dial-peer voice VMOABRI 1
VMOAport 2
VOATM-transport-profile 0
dial-peer-voice-POTS 1
VMOA-connection-id 0
exit
dial-peer voice VMOABRI 2
VMOAport 3
VOATM-transport-profile 0
dial-peer-voice-POTS 2
VMOA-connection-id 0
exit
dial-peer voice VMOABRI 3
VMOAport 4
VOATM-transport-profile 0
dial-peer-voice-POTS 3

! Enabling the BLES connection
VMOA-connection-id 0
no shutdown
exit
exit

```

### 2.3.2 VTOA Example

Configuration of a full E1 in trunking mode over the VP/VC 2/46, coder G.726+VAD, time-slot 16 used for signaling:

```

! ATM PVC configuration
interface atm 0.1
pvc voiceoa vpi 2 vci 46 PARIS
qos cbr pcr 2304000
priority 1
execute
exit
exit

! Physical voice port declaration
voice-port 5/0
exit

! PRI interface parameters
interface pri 5/0
linecode hdb3
physical-interface E1
exit

! local voice ports
dial-peer voice POTS 0
port 5/0
exit

! VTOA connection configuration (disabled by default)
VTOA-connection 0
atm-pvc PARIS
jitter 30
exit

! Voice over ATM profile configuration
voatm-transport-profile 0
coder-profile atmf8 1 a-law
silence-detection vadcneg
exit

! VTOACCS port configuration
dial-peer voice vtoaccs 0
voatm-transport-profile 0

```

```

vtoa-connection-id 0
dial-peer-voice-pots 0
cid 1 voice 160
cid 2 voice 161
cid 3 voice 162
cid 4 voice 163
cid 5 voice 164
cid 6 voice 165
cid 7 voice 166
cid 8 voice 167
cid 9 voice 168
cid 10 voice 169
cid 11 voice 170
cid 12 voice 171
cid 13 voice 172
cid 14 voice 173
cid 15 voice 174
cid 16 sig 128
cid 17 voice 175
cid 18 voice 176
cid 19 voice 177
cid 20 voice 178
cid 21 voice 179
cid 22 voice 180
cid 23 voice 181
cid 24 voice 182
cid 25 voice 183
cid 26 voice 184
cid 27 voice 185
cid 28 voice 186
cid 29 voice 187
cid 30 voice 188
exit

```

**! Enabling the VTOABLES connection**

```

vtoa-connection 0
no shutdown
exit
exit

```

### 2.3.3 CES Example

Configuration of an E1 in structured mode over the VPI=2/VCI=46, time slot 1 to 31.

**! ATM PVC configuration**

```

interface atm 0.1
pvc voiceoa vpi 2 vci 46 PARIS
qos cbr pcr 2304000
type aal1
structured no-pf
priority 1
execute
exit
exit

```

**! Physical voice port declaration**

```

voice-port 5/0
clock-source aal1
exit

```

**! PRI interface parameters**

```

interface pri 5/0
linecode hdb3
physical-interface E1
exit

```

**! local voice ports**

```

dial-peer voice POTS 0

```

```
port 5/0
exit
```

**! VTOA connection configuration (disabled by default)**

```
VTOA-connection 0
atm-pvc PARIS
jitter 5
exit
```

**! VTOACES port configuration**

```
dial-peer voice vtoaces 0
vtoa-connection-id 0
dial-peer-voice-pots 0
ts 1 31
exit
```

**! Enabling the VTOA connection**

```
vtoa-connection 0
no shutdown
exit
exit
```

## 2.4 VOATM STATISTICS

The Command Line Interface provides access to statistics and configuration status for the voice service. The show command can be used at any level in the CLI tree.

The syntax is the following:

```
CLI> show voice <function> [<parameter> [{ index <index> | all }]]
```

function defines the voice function

parameter defines the type of port or connection within the function

index specifies the port or connection number within the type; all specifies all ports or connections.

### 2.4.1 Running Configuration

The following command provides the current voice configuration with a list of CLI commands that are the exact differences between the current configuration and the default configuration. This command enables easy replication of configuration over other devices.

This set of commands can be entered in another device to set up the voice service with the same parameters. First, it is preferable to use the voice-default CLI command to ensure that the device starts with the same default configuration.

```
CLI> show voice running-config
Building configuration...
voice-default
vmoa-connection 0
atm-pvc paris
jitter 30
les-cap
les-common-control
exit
voatm-transport-profile 0
coder-profile userdefined 0 a-law
user-coder 0-3 g711generic-64 5000 5000 1
exit
dial-peer voice pots 1
port 5/0
exit
dial-peer voice vmoabri 0
dial-peer-voice-pots 0
vmoa-connection-id 0
vmoa-port 1
voatm-transport-profile 0
exit
dial-peer voice vmoabri 1
dial-peer-voice-pots 1
vmoa-connection-id 0
vmoa-port 2
voatm-transport-profile 0
exit
dial-peer voice vmoabri 2
dial-peer-voice-pots 2
vmoa-connection-id 0
vmoa-port 3
voatm-transport-profile 0
exit
dial-peer voice vmoabri 3
dial-peer-voice-pots 3
vmoa-connection-id 0
```

```
vmoa-port 4
voatm-transport-profile 0
exit
vmoa-connection 0
no shutdown
exit
CLI>
```

## 2.4.2 Voice Hardware and Software versions

To show the voice hardware configuration enter:

```
CLI> show voice hardware full
Voice module : 6 lines
MotherBoard  : 2 BRI
Ext Module   : MF100
               : 4 FXS
```

To show the voice software version enter:

```
CLI> show voice version
Voice VOIP version: _V29B (28/05/09 19:47:53)
Voice DSP version: 40536
```

## 2.4.3 ISDN active calls

To display the list of active (connected) calls using ISDN ports, enter:

```
CLI> show isdn active
-----
ISDN ACTIVE CALLS
-----
App.  Call      Calling      Called      Call      Port BChan Call-ref call-id
     Type      Number      Number      Duration
-----
Data Out                2123456789 00:09:05  5/2    1        6        21
Data Out                2123456789 00:08:59  5/2    2        7        23
Data Out                2123456789 00:08:59  5/3    1        4        22
Voice In           1001          1006 00:00:49  5/4    1        3        13
Voice Out          1005          1004 00:00:06  5/5    1        2        18
-----
```

## 2.4.4 BRI/S0 Voice Port Statistics

The command to display statistics on a BRI voice port is (in this example, voice port number 0):

```
CLI> show voice voice-port bri index 0
voice port 5/0
protocol descriptor BRI_NT
current state activated
config state up
layer 1 status activated
attached vmoabri dial peer 0
number of voice communication 0
bri Tx frames on D channel 40
bri Rx frames on D channel 41
```

Notes:

- The Layer 1 state (layer 1 status) may be deactivated if no communication is in progress.
- Number of voice communications: 0, 1 or 2. Current number of B channel with compression enabled.
- `show voice voice-port bri all` displays statistics on all the voice ports.

### 2.4.5 FXS Voice Port Statistics

To show statistics on a FXS physical port, enter:

```
CLI> show voice voice-port fxs index 0
voice port 5/0
current state on hook
config state up
attached vmoa fxs dial peer 0
voice communication no
```

Notes:

- Voice communication is indicated as "yes" if the voice path is activated.
- `show voice voice-port fxs all` displays statistics on all the voice ports.

### 2.4.6 PRI Voice Port Statistics

The following command returns statistics about the physical E1/PRI port.

```
CLI> show voice voice-port pri index 0
voice port 5/0
physical type E1
protocol descriptor E1_PRI
current state activated
config state up
layer 1 status deactivated
number of voice communications 0
pri AIS occurrence 0
pri RDI occurrence 0
```

Notes:

- The "number of voice communications" is the number of current established voice paths.
- `show voice voice-port pri all` displays statistics on all the voice ports

### 2.4.7 BLES BRI Voice Port

The following statistics are specific to the internal port voice BRI connected to voice gateway (CO).

The used command (e.g. for VMOABRI number 0) is:

```
CLI> show voice dial-peer voice vmoabri index 0
dial-peer 0
attached physical port 5/0
current state activated
config state up
port status unblocked
blocking occurrence 0
total blocking duration 0
B-channel allocation number 0
total B-chn alloc. duration 0h 0m 0s
B1 channel
current state deallocated
current Tx coder none
current Rx coder none
current BC voice
current CID none
voice packet send 0
voice packet received 0
B2 channel
current state deallocated
current Tx coder none
current Rx coder none
current BC voice
current CID none
voice packet send 0
voice packet received 0
```

```

D channel
current state allocated
current CID 128
voice frames send 40
voice frames received 41

```

Notes:

- Current BC: (Bearer Capability) voice or voiceband data or unrestricted
- Blocking occurrence: Number of "block" commands received from the CO (when using ELCP)
- 'show voice dial-peer voice vmoabri all' displays statistics on all the BLES ports

#### 2.4.8 BLES FXS Port Statistics

The following command returns statistics on a dial peer VMOAFXS port:

```

CLI> show voice dial-peer voice vmoafx index 2
dial-peer 2
attached physical port 5/2
current state up
current Tx coder g711generic-64
current Rx coder g711generic-64
current BC voice
current CID 18
voice packet send 1314
voice packet received 1307

```

Note:

- 'show voice dial-peer voice vmoafx all' displays statistics on all the BLES ports

#### 2.4.9 BLES PRI Port Statistics

The following command returns statistics about a BLES PRI port:

```

CLI> show voice dial-peer voice vmoapri index 0
dial-peer 0
attached physical port 5/0
port status unblocked
current state up
config state up
B-channel allocation number 4
total B-chn alloc. duration 0h 0m 0s
D channel :
current state allocated
current CID 128
voice frames send 134
voice frames received 97
Allocated B channels :
-----
Time- cate- Tx Rx BC CID -----Packets----
slot gory coder coder sent received
-----
1 voice g711a g711a voice 160 2300 2280
4 voice g711a g711a voice 167 4560 4575
7 voice g711a g711a voice 165 6765 6770
17 voice g711a g711a voice 163 8785 8780

```

Notes:

- BC: (Bearer Capability) voice or voiceband data or unrestricted
- Blocking occurrence: number of "block" commands received from the CO (when using ELCP)
- show voice dial-peer voice vmoabri all displays statistics on all the BLES ports

#### 2.4.10 VTOA-CCS Port Statistics

The following command returns statistics about the VTOA-CCS port and for each time-slot:

```
CLI> show voice dial-peer voice vtoaccs ind 0
dial-peer 0
attached physical port 5/0
current state up
config state down
Time-Slot :
-----
Time- cate- Tx Rx CID -----Packets-----
slot gory coder coder sent received
-----
1 voice g711a g711a 16 0 0
2 voice g711a g711a 17 0 0
16 sig none none 18 0 0
```

#### 2.4.11 VTOA CES Port Statistics

The following command provides statistics for the VTOA-CES port:

```
CLI> show voice dial-peer voice vtoaces ind 0
dial-peer 0
attached physical port
current state up
config state up
aal1 statistics:
syncro state up
out-of-sync occurrences 1
transmitted cells 400479
received valid cells 312603
rx overflows 0
rx underrun 1
rx invalid pointers 0
rx crc error 0
rx cell loss 1
```

Notes:

- synchro state: is 'up' if a correct AAL1 cell is received. It is 'down' when no correct cell is received during the time configured cell-loss-integ-period.
- An important value of rx underrun may indicate that the jitter is greater than the value configured in vtoa-connection.

#### 2.4.12 BLES/VMOA Connection

The following command provides global statistics about the connection (e.g. connection 0) with the voice gateway (CO):

```
CLI> show voice vmoa-connection index 0
vcd connection (line, vp, vc) 0, 0, 38
atm vc current state activated
atm vc config state up
atm vc failure occurrences 0
atm vc total failure duration 0
v5pstn
current established voice path 0
outgoing voice path est. req. 0
incoming voice path est. req. 0
elcp
total successful allocations 4
total unsuccessful allocations 0
total allocation duration 0
lapv5
current state established
number of Rx frames 924
number of Tx frames 929
```

```

number of Rx I frames 30
number of Tx I frames 30
number of Rx REJ frames 0
number of Tx REJ frames 0
number of Rx RNR frames 0
number of Tx RNR frames 0
number of T200 expirations 5
aal2 ssted
number of frames received 821013
number of frames sent 823093
frames received and discarded 19775
frames received with errors 0
frames sent and discarded 0

```

Notes:

- aal2 ssted: Transports ISDN signaling frames (D Channels) and ELCP/V5 frames.
- lapv5: Transports ELCP and V5 PSTN frames.

#### 2.4.13 VTOA Connection

The following command returns statistics about a VTOA connection (VC status, AAL2 flows):

```

CLI> show voice vtoa-connection index 0
Vcd connection 0, 2, 46
atm vc current state up
atm vc config state up
atm vc failure occurrences 0
atm vc total failure duration 0
aal2 ssted
number of frames received 0
number of frames sent 0

```

#### 2.4.14 Event Display

The voice service generates events or log messages: warnings, errors or informational messages.

To view the messages on the CLI interface enter:

```

CLI> event filter add vox all MEM
CLI> monitor event

```

Events list

- Layer 1 on ISDN BRI port <5/x> <activated or deactivated>: ISDN layer 1 state (info)
- Layer 1 Error on ISDN BRI port <5/x> <activation failure / deactivation>: ISDN layer 1 error. Can indicate that the ISDN line is disconnected.
- Layer 1 on E1/T1 port <5/x> <activated or deactivated>: G703/G704 state on PRI port
- Alarm on E1/T1 port <5/x> <LOS, AI, RAI, End of LOS, End of AI, End of RAI>: Alarm detected on PRI port (compliant to G704).
- FXS port <off-hook>, <on-hook>, <ringing on>, <ringing off>: Event on FXS analog port.
- Voice port <5/x> status change: <shutdown / no shutdown>: Indicates that the interface has been shutdown by the operator. The port cannot be used for calls.
- Connection to BLES voice gateway <vcd> established: If ELCP is used; it indicates that the RESTART procedure with the remote BLES gateway is successful (LAPv5 established).
- Connection to BLES voice gateway <vcd> failure - <cause of failure>: If ELCP is used, it indicates that the RESTART procedure has failed.
- VoATM VP/VC <vcd> status change: <shutdown / no shutdown / ready / disconnected>: Indicates the state of the ATM VCC used to access to the voice gateway.

- VMOA port <vcd:VMOA port> status change <blocked/unblocked> by <vgw/user>: Indicates that a "block" "unlock" command has been received (from the gateway or with a shutdown/no shutdown command on VMOA port).
- ISDN VMOA port <vcd:VMOA port> D-Channel allocated (CID: <CID>): The D channel is allocated by the voice gateway. Voice calls are possible on the ISDN port.
- ISDN VMOA port <vcd:VMOA port> D-Channel de-allocated (CID: <CID>): The D channel is de-allocated by the voice gateway. Voice calls are no longer possible on the ISDN port.
- ISDN VMOA port <vcd:VMOA port> B-channel <B1..B30> allocated (CID: <CID>, Type: <voice/data>): Indicates that the B channel is established (voice coding enabled).
- ISDN VMOA port <vcd:VMOA port> B-channel <B1..B30> de-allocated: Indicates that the B channel is disconnected (end of voice call).
- VMOA port <vcd:VMOA port> allocation failure <cause>: Indicates an internal error while allocating a channel. This can be due to a lack of DSP resource.
- <number> Voice packet lost on CID <vcd> <cid>: Indicates packet loss on the received flow.
- <number> Excessive Jitter on CID <vcd> <cid>: Indicates that the jitter is greater than the configured value (vmoa/vtoa connection).
- FAX/Modem detected on CID <vcd> <cid>: Indicates that a FAX/modem is detected, which allows the disabling of the echo canceller.
- End of FAX/Modem on CID <vcd> <cid>: Indicates a return to voice mode (the echo canceller is enabled again).
- Voice coder <coder><transmitting/receiving> on CID <vcd> <cid>: Indicates the voice coder currently used.
- DSP failure <dsp number> <cause of failure> Indicates a DSP internal error (software crash).
- <number> Invalid voice packets received: Indicates that invalid voice packets have been received. This event may be due to a wrong ATM voice profile.
- Voice activation <false / true> on CID <vcd> <cid>: Voice activation in implicit mode. Mainly used for FXS in CAS mode, while ELCP is not supported.
- System clock is synchronized on AAL2 clock on CID <vcd> <cid>: The adaptive clock recovery system is operational and works on the indicated CID.
- No sync clock. Fallback to free run clock: The adaptive clock recovery system has not detected a valid incoming AAL2 flow.
- Sync clock is back: The adaptive clock recovery system has detected a valid incoming AAL2 flow and is operational.
- AAL2 clock differs from system clock on CID <vcd> <cid>: Potential synchronization problem detected by the adaptive clock recovery system.
- AAL1 synchronized on VP/VC <vcd>: normal AA1 cell flow received.
- AAL1 out of synch on VP/VC <vcd>: incorrect cell received during a specified delay.
- <number> Excessive Jitter on AA1 VP/VC <vcd>: the jitter is greater than the configured value (see vtoa-connection).
- <number> Invalid cells received on AA1 VP/VC <vcd>: invalid AAL1 cells have been received.

## 2.5 VOATM DEBUG TOOLS

### 2.5.1 ELCP protocol capture

It is possible to have a complete trace of all the ELCP protocol messages exchanged between the OneOS-based voice-capable router and the CO on CID 8.

On the CLI point of view, it relies on the logging command principle, already available for ip debugging.

Enter the following command:

```
CLI> debug v5 <vmoa connection id>
```

Example:

```
CLI>debug v5 0
09:06:43.062 Cpe:0 L1 frame sent.
09:06:43.062 Cpe:0 L2 tx SABME P/F=1 C/R=0.
09:06:43.063 hex: 00 01 7f
09:06:43.085 Cpe:0 L1 frame received.
09:06:43.085 Cpe:0 L2 rx UA P/F=1 C/R=0.
09:06:43.085 hex: 00 01 73
09:06:49.525 Cpe:0 L1 frame received.
09:06:49.525 Cpe:0 L2 rx INFO P=0 NR=0 NS=0 C/R=1.
09:06:49.526 hex: 02 01 00 00
09:06:49.526 Cpe:0 L3 rx ALLLOC (cid=129) bccref:0x4020.
09:06:49.526 hex1: 48 40 20 20 40 02 00 05 41 01 80 48 01 81
09:06:49.527 Cpe:0 L1 frame received.
09:06:49.527 Cpe:0 L2 rx INFO P=0 NR=0 NS=1 C/R=1.
09:06:49.527 hex: 02 01 02 00
09:06:49.527 Cpe:0 L3 rx ALLLOC (cid=128) bccref:0x4021.
09:06:49.527 hex1: 48 40 21 20 40 02 00 03 41 01 80 48 01 80
09:06:49.531 Cpe:0 L1 frame sent.
09:06:49.531 Cpe:0 L2 tx RR P/F=0 NR=1 C/R=1.
09:06:49.531 hex: 02 01 01 02
09:06:49.532 Cpe:0 L1 frame sent.
09:06:49.532 Cpe:0 L2 tx RR P/F=0 NR=2 C/R=1.
09:06:49.532 hex: 02 01 01 04
09:06:49.538 Cpe:0 L1 frame sent.
09:06:49.538 Cpe:0 L2 tx INFO P=0 NR=2 NS=0 C/R=0.
09:06:49.538 hex: 00 01 00 04
09:06:49.538 Cpe:0 L3 tx ALLLOC COMP bccref:0x4020.
09:06:49.538 hex1: 48 40 20 21
09:06:49.539 Cpe:0 L1 frame sent.
09:06:49.539 Cpe:0 L2 tx INFO P=0 NR=2 NS=1 C/R=0.
09:06:49.539 hex: 00 01 02 04
09:06:49.540 Cpe:0 L3 tx ALLLOC COMP bccref:0x4021.
09:06:49.540 hex1: 48 40 21 21
09:06:49.555 Cpe:0 L1 frame received.
09:06:49.555 Cpe:0 L2 rx RR P/F=0 NR=1 C/R=0.
09:06:49.555 hex: 00 01 01 02
```

### 2.5.2 ISDN protocol capture

It is possible to capture the ISDN signaling of the D Channel of each BRI or PRI interface.

Please refer to "ISDN Signaling Capture" section in "VoIP Troubleshooting tools" chapter of "OneOS – VoIP User Guide" document for more details.

### 2.5.3 LEDs

#### 2.5.3.1 ONE200/400 (two "Voice" LEDs)

On the front panel, two LEDs indicate the state of the voice service:

**LED Voice:**

- Green: Connection to the voice gateway OK. If ELCP is used, this state indicates that LAPv5 is established. For CES, it indicates that a correct AAL1 cell flow is received.
- Red: No connection with the voice gateway or AAL1 out of sync.
- Off: The voice service is not used.

**LED Com:**

- Green: At least one voice communication is established (or a B channel allocated).
- Off: No voice communication in progress.

On the rear panel, two LEDs are associated to each BRI port (depending on hardware):

**Green LED:**

- Off: ISDN layer 1 not activated.
- On: ISDN layer 1 activated.

**Yellow LED:**

- Off: No voice communication in progress.
- On: At least one voice communication established (B channel allocated).

#### 2.5.3.2 Other ONEXX0 devices (only one "Voice" LED)

**LED Com:**

- Green: Connection to the voice gateway OK. If ELCP is used, this state indicates that LAPv5 is established. For CES, it indicates that a correct AAL1 cell flow is received.
- Blinking Green: Connection to the voice gateway OK; at least one voice path is established.
- Red: No connection with the voice gateway or AAL1 out of sync.
- Off: The voice service is not used.